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ABSTRACT

The purpose of this study was to design and test a remedial reading instructional strategy for word recognition skills utilizing specific intersensory transfer components. The subjects were 56 high school sophomores and juniors enrolled in special education classes. Eight subjects were randomly selected from each of seven special education classes. These classes included two groups classified as educable mentally handicapped, two groups classified as learning disabled, and three groups classified as underprivileged or deprived. A word recognition test was constructed and administered before and after treatment conditions. The treatment groups represented three commonly used word recognition exercises and one intersensory transfer exercise. All treatments attempted to teach the 50 words presented in the word recognition tests. The results indicated that the intersensory transfer method was statistically superior to any one of the other techniques over and above standardized reading achievement scores, pretest scores, race differences, and sex differences. (WR)

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INCREASING WORD RECOGNITION SKILLS IN HIGH SCHOOL REMEDIAL READERS THROUGH SYSTEMATIC INTERSENSORY TRANSFER

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INCREASING WORD RECOGNITION SKILLS IN HIGH SCHOOL REMEDIAL READERS THROUGH SYSTEMATIC INTERSENSORY TRANSFER

The authors of this paper attempted to design and test a remedial reading instructional strategy for word recognition skills utilizing specific intersensory transfer components.

Investigations into the relationships of intersensory transfer abilities and reading achievement test scores have largely been correlational in design. Results obtained from such research give indications of possible predictors of reading achievement. They do not infer that reading is the product of such perceptual processes. Such studies have indicated that auditory-visual transfer abilities are significantly correlated with reading achievement (Birch and Belmont, 1964; Birch and Belmont, 1965; Muehl and Kremenak, 1966; Beery, 1967; Ford, 1967; Rudnick, Sterritt, and Flax, 1967; Kahn and Birch, 1968) through at least sixth grade. Visual-auditory transfer ability (Muehl and Kremenak, 1966; Beery, 1967) tactile-visual transfer ability (Ford, 1967) and visual-visual transfer ability (Rudnick, Sterritt, and Flax, 1967) have been found to be similarly correlated with reading achievement ar various age levels.

A few studies (Bursuk, 1971; Crippen, 1968; Jester and Travers, 1966) hint at the instructional possibilities of intersensory transfer. In general, these investigations indicate that reading instruction emphasizing auditory-visual transfer is superior, in terms of reading achievement test scores, to methods which stress only one modality.

A Model of Word Recognition

Language acquisition can be viewed as the auditory encoding of all

sensory experience. A child receives auditory cues from his parents with reference to concrete experiences and learns to associate these sounds with his experiences. In addition, he rehearses the kinesthetic production of these sounds so that the information is stored in long term memory (see Figure 1).

Insert Figure 1
about here

Reading words involves the recoding or transfer of visual stimuli (symbols) into the auditory form of language. In order for this to occur, the individual must essentially add a new dimension to his language acquisition format -- a type of visual (visual information storage) to auditory transfer has to take place. The symbols have to become associated with language acquisition, (see Figure 2).

Insert Figure 2
about here

Another skill often overlooked on the subject of word recognition is the ability to correctly graphically spell words. From the viewpoint of this model, spelling and writing words is the linking of kinesthetic responses to the word reading process. These kinesthetic responses naturally result in visual input which feed into the reading and language perceptual systems. Learning to correctly write words is a copying or visual to kinesthetic transfer procedure which yields a visual product which can then be read or verbalized (see Figure 3).

Insert Figure 3
about here

An instructional procedure which establishes the perceptual relationships posited in this model should be effective in increasing word recognition skills. A procedure of this sort would guide the student through the language acquisition process discussed above (if the student is quite young or unsophisticated linguistically) while adding the reading and writing components in terms of the word chosen to be taught. Basically, the student would be shown a word and would be given its auditory representation. He would verbalize the word and then listen to a recording of his verbalization while looking at the word. Finally, he would write the word down and read his writing.

It is hypothesized that an instructional technique derived from the model above will be superior to other operationally defined methods in terms of increasing demonstrable word recognition skills over and above four covariates. These covariates include standardized reading achievement test scores, pretreatment word recognition test scores (pretests), racial groupings, and sex differences. In terms of positing that some treatment will be more effective than no treatment (control condition), it is further hypothesized that the average result of all treatment groups combined on word recognition measures will be superior to a nontreatment condition over and above the four covariates.

Method

Subjects

The subjects were fifty-six high school sophmores and juniors (ages 15 to 16) enrolled in Special Education classes at Carbondale Community High School in Carbondale, Illinois. Eight subjects were randomly selected from each of seven Special Education classes. These classes included two groups classified as Educable Mentally Handicapped, two groups classified as Learning Disabled, and three groups classified as Underprivileged or Deprived. Screening for any obvious physical disabilities was undertaken before any student was admitted to the subject pool.

Design

A word recognition test was constructed and administered before and after treatment conditions. The test was composed of fifty words randomly selected from two basic word lists (Dolch Basic Sight Words and Wilson's Essential Vocabulary List). One form of the test required the subjects to correctly write words which were presented auditorally (spelling). The other form of the test had the subjects orally read words presented to them visually (oral reading). Each subject received both forms. The order in which the two tests were administered was determined by randomly assigning subjects to either of two testing sequences (oral reading then spelling or spelling then oral reading). This sequence was maintained for both pretest and posttest administrations. To control for juxtaposition effects between the two tests, a minimum time of twenty-four hours between test administrations was established.

Four treatment groups were utilized. The treatment groups represented three commonly used word recognition exercises and one intersensory transfer exercise based on the word recognition model. A control group received the pretest and posttest only.

All treatments attempted to teach the fifty words which were presented in the word recognition tests. Figure 4 illustrates how each treatment was structured.

Insert Figure 4
about here

Each treatment was designed to be comparable to the others in terms of its total time duration. In addition, each treatment required the subject to see the correct form of a word exactly five times.

Four variables were covaried. These included word recognition pretest scores, reading achievement test scores (Gates-MacGinitie Reading Tests, Survey D), race, and sex. Reading achievement test scores on the Gates-MacGinitie Reading Tests were

derived by computing the means of the standard scores on the Vocabulary and Comprehension sections (in correspondence with directions given in the Teachers' Manual for grouping scores). Both word recognition pretest scores and reading achievement test scores were treated as continuous variables. Race and sex, in terms of this study were dichotomously categorized.

Procedure

Once the population sample was selected, twenty-eight subjects were randomly assigned to the oral reading then spelling testing sequence while the remaining twenty-eight subjects were assigned to the opposite sequence. The subjects were then randomly placed into treatment groups.

The Gates-MacGinitie Reading Test (Survey D) was administered prior to the other testing conditions and various treatment conditions. It was group-administered to subjects in each of the seven classrooms by one of the experimenters.

The spelling pretests and posttests were presented on a prerecorded tape cassette. Thirty seconds per written response was allowed for each word presented resulting in a test administration time of twenty-five minutes. Scores on this test were based upon the total number of correct written responses.

The oral reading pretest and posttest administrations were accomplished by having the subjects orally read the word list into a tape recorder. These tape recordings were then evaluated and scored by one of the experimenters and two raters. The raters were two undergraduate students enrolled in an Educational Psychology course who were naive with respect to the intents of the study.

All treatments as well as spelling and oral reading pretests and posttests were conducted in the high school's Learning Center. Subjects reported to the Learning Center from their regularly scheduled classes. Each treatment group was scheduled to begin the testing and treatment sequences on a Monday. The exact sequencing is provided in Figure 5. Each daily meeting with the subjects took place during a fifty-minute class period.

Insert Figure 5
about here

Those subjects assigned to the control group reported to the Learning Center on Wednesdays and Thursdays but were allowed access to various materials available instead of receiving any of the treatments.

The four test administrations and the treatment conditions were performed by fifteen undergraduate tutors from Southern Illinois University who were assigned to the reading laboratory as a practicum experience in Secondary Education. Each of the tutors was given the word lists, instructions regarding test administrations, and instructions for accomplishing each treatment condition. A meeting of the tutors with the experimenters, regarding the technical and logistical aspects of the study, took place prior to the initiation of the experiment. The tutors were made aware of the technicalities of the study but were not made aware of the experiemnters' expectations.

The Intersensory Transfer Method (ITM) required special equipment. This equipment included audio flashcards and equipment which had the capability to to prerecord on one channel of an audio flashcard and allow the recording of subject's verbal responses on another channel of the flashcard. Tutors always supervised the subjects' use of the equipment.

Results and Discussion

The sixth grade scales of Form D of the Gates-MacGinitie Reading Test were utilized in scoring the tests. The mean sixth grade scaled score for all subjects on the Gates-MacGinitie Test was 38.00 ($s = 15.19$). This indicates that the average subject in this study was reading below the mean sixth grade level (the fiftieth percentile is represented by a score of 50).

There was no difference between the scoring of the experimenter and the scoring of the two raters (r = 1.00) on the oral reading tests.

The means and standard deviations of both the oral reading and the spelling test scores for each treatment group are presented in Table I. All treatment groups made gains from pretests to posttests.

Insert Table I

Multiple linear regression (McNeil, Kelly, and McNeil, 1973) was used to compute R^2 and F values for each of the treatment comparisons and for the collapsed treatment groups-control group comparison over and above the covariates. Results were significant ($\alpha = 0.05$) and in the hypothesized direction. In terms of oral reading, the ITM group's posttest scores were significantly greater than posttest scores for the Context Method group ($F = 5.27$; $df = 1, 16$; $p = 0.02$; R^2 for full model = 0.89), the Spelling Method group ($F = 25.01$; $df = 1, 16$; $p = 0.00006$; R^2 for full model = 0.82), and the Phonics Approach group ($F = 20.45$; $df = 1, 16$; $p = 0.0006$; R^2 for full model = 0.81) over and above the covariates. Collapsed treatment groups posttest scores were significantly greater than posttest scores for the control group on both the oral reading test ($F = 6.78$; $df = 1, 50$; $p = 0.006$; R^2 for full model = 0.90), and the spelling test ($F = 8.80$; $df = 1, 50$; $p = 0.002$; R^2 for full model = 0.87) over and above the covariates.

Significant interactions between pretests and treatments ($\alpha = 0.10$ -- two tailed) were derived for both the oral reading test and the spelling test. These interactions were interpreted as being the result of a ceiling effect imposed by the instrumentation of the criterion measure. In other words, subjects who scored approximately 45 or better on either pretest were already at or near the top of the criterion (50) and treatment

differences would have very little impact on them. Due to these high-scoring individuals, consideration of interaction may provide greater predictability of the criterion, but it should not limit the generalizability of the main results in terms of the superiority of the ITM.

Since there was no restriction on the amount of time a subject could take in completing the oral reading tests, some scores could have been the product of the amount of time used. Each of the subjects' recordings were, therefore, timed and correlations between test scores and amount of time taken to complete the test were computed. The results indicate that on both pretests ($r = -0.54$, $p < 0.05$) and posttests ($r = -0.63$, $p < 0.05$), the test scores were inversely related to the amount of time taken to complete the test. Quite simply, when the words were known, subjects took less time to complete the test and, conversely, when the subjects did not know the words, they took more time to complete the test.

To determine whether a fatigue effect was present on either the oral reading tests or the spelling tests, the fifty words on each test were split in half according to their order of presentation. Each subject's total score was thus viewed as two separate test scores. A t-test was used to determine whether there was any significant differences between halves. No significant differences were found on the pretests or the posttests for either of the two tests.

To determine if any pattern existed across groups in terms of individual word responses, multiple discriminant analysis (Veldman, 1966) was utilized. No significant results were derived. Essentially, an item by item analysis demonstrated that most subjects got each individual item correct to the extent that there was almost no variance per item. Differences among individual subjects must be interpreted on a total score basis since the analysis of individual items cannot be interpreted.

It can be deduced that the oral reading and spelling tests were relatively easy tests. The internal consistency (reliability) of the two pretests was, therefore, computed so as to figure out whether these instruments were subject to variable errors. The Kuder-Richardson 20 (KR20) formula was utilized to measure this internal consistency. R_{tt} was determined to be 0.95 with the standard error of measurement equal to 1.85 on the oral reading pretest. R_{tt} was determined to be 0.94 with the standard error of measurement equal to 2.02 on the spelling pretest. It can be inferred that both pretests, based on this sample population, were reliable.

Conclusions

It has been posited that coordination of certain sense modalities, when it occurs, increases the probability that a written word will be retained in terms of correct pronunciation and in terms of accurate reproduction (spelling). An instructional technique termed the Intersensory Transfer Method (ITM) was derived from a model of word recognition. This technique was then compared with controlled versions of existent word recognition instructional techniques in terms of the oral reading and the spelling of individual basic sight vocabulary words, for high school remedial readers. A comparison was also made between technique-treatment conditions and a control condition so as to determine the relative effects of treatments as a whole. Statistical analyses revealed that ITM was superior to any one of the other techniques over and above standardized reading achievement scores, pretest scores, race differences, and sex differences. Treatments were determined to be superior to no treatment (control condition) over and above standardized reading achievement

scores, pretest scores, race differences, and sex differences. It can, therefore, be concluded that ITM was a more effective technique than any of the other methods and was more effective than a no-treatment condition.

The concurrence of the data with the hypotheses warrants that this study be further analyzed in future studies. To increase the validity and generalizability of such future investigations, several suggestions shall be offered.

To better understand the complexities of word recognition, a word list should be devised which scales both word complexity (length and configuration characteristics) and word meaning (semantics). Results obtained with a word list of this sort would provide more insight into these categorical phenomena.

Hawthorne, novelty and disruption effects could have limited the results reported in this study. Two possible controls for these extraneous effects would be: 1. Include the study as part of an on-going remedial reading language arts program. Differential conditions would thus be limited as a motivational factor. 2. Split the Intersensory Transfer Method group into two subgroups and have one subgroup receive a desensitization procedure for use of the equipment while the other group receives no such desensitization. Comparisons between the subgroups should show the extent to which novelty plays a part in ITM.

ITM was derived from a model of word recognition. In corresponding to this model, ITM presented the words to be learned in a specific instructional sequence. To further analyze both the model of word recognition and the method, studies concerned with variations of the sequencing evident in ITM and their relevant effects should be conducted. Thus, it could be better determined if either the sequencing or the inclusion of certain intersensory transfers has the greater influence on word recognition acquisition.

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Rudnick, M.; Sterritt, G. M.; and Flax, M. Auditory and visual rhythm perception and reading ability, Child Development, 1967, 38, 581-588.

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FIGURE 1
Perception and Acquisition of Language

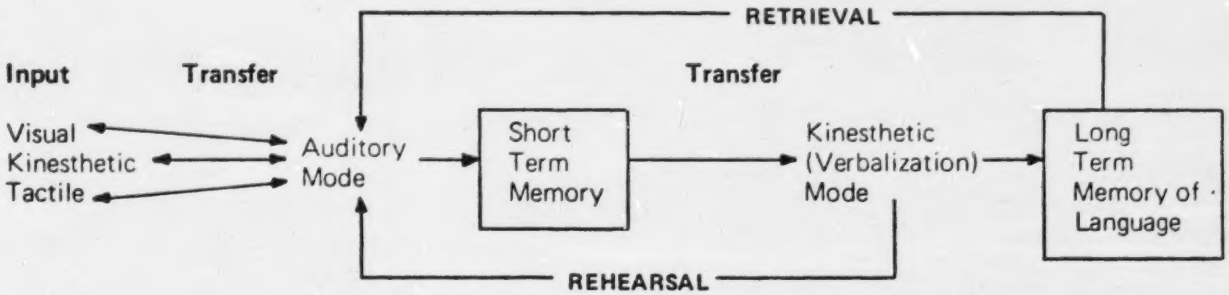

FIGURE 2
Perception and Visual Word Recognition Acquisition

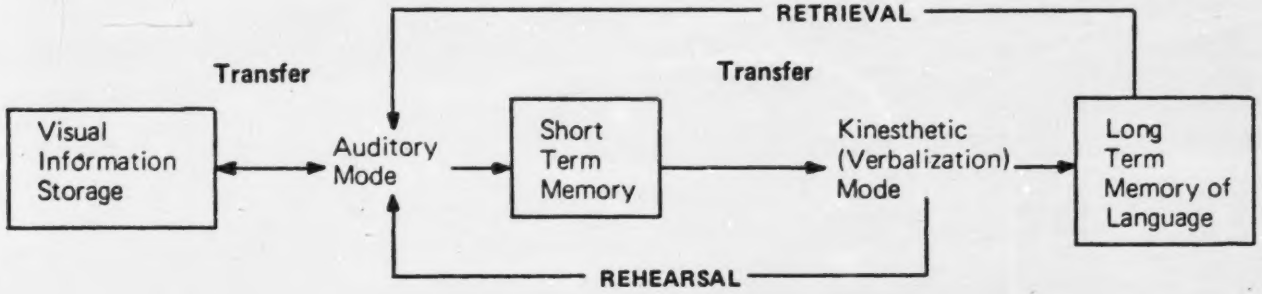

FIGURE 3
Perception and Writing Acquisition

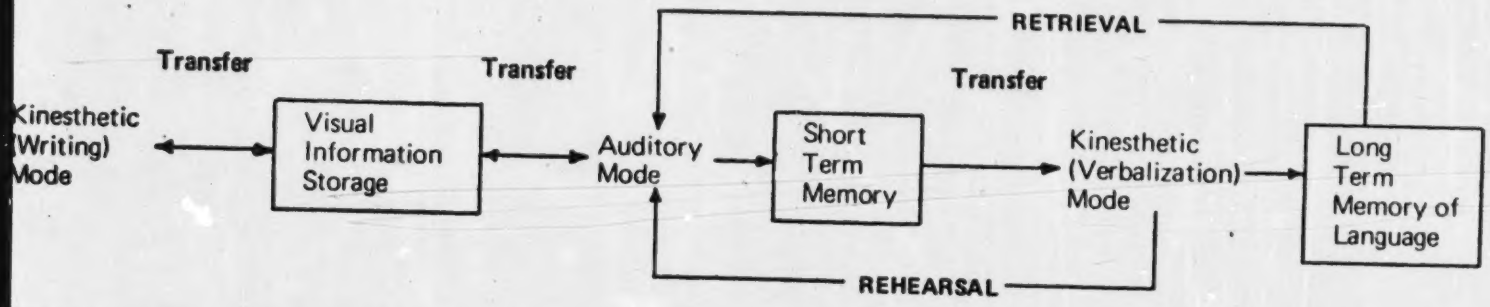

Figure 4. Treatment Formats

Intersensory Transfer Method

1. S looks at written word on flashcard and plays prepared auditory recording for that word.
2. S records on tape the correct verbal response for that word while looking at word.
3. S plays back his recording while looking at word.
4. S writes the word.
5. S reads the word he has written to E.

Context Method

1. E gives S a word orally.
2. S orally gives two phrases or sentences using the word.
3. With help from E, S writes his phrases or sentences and underlines the word originally given to him.
4. S reads the sentences or phrases to E twice.
5. S reads the word underlined twice.

Spelling Method

1. Ten words or phrases at a time are given orally to S by E.
2. S writes word as best he can.
3. Word is immediately corrected.
4. S copies any word missed.
5. S reads all ten words to E four times.

Phonics Approach

1. S reads a word as best he can.
2. Words missed are broken into syllables by E (or in the case of one syllable words into vowels and consonants).
3. E presents the syllabication to S and gives the phonic elements of each syllable.
4. S repeats each syllable.

5. S reads the whole word twice.

6. E corrects words, S reads words 4 more times.

Figure 5. Testing and Treatment Schedule

Monday	Tuesday	Wednesday	Thursday	Friday	Monday
Pretest 1	Pretest 2	Treatment	Treatment	Posttest 1	Posttest 2

TABLE I

WORD RECOGNITION TEST SCORE MEANS AND STANDARD DEVIATIONS BY TREATMENT GROUPS

	Pretest	S.D.	Posttest	S.D.
Oral Reading				
Intersensory Transfer Method	43.09	4.39	49.73	o.65
Context Method	38.73	12.63	42.27	12.51
Spelling Method	45.55	7.26	46.36	5.95
Phonics Approach	45.18	9.09	46.09	9.04
Control	39.83	10.63	40.33	10.95
Spelling				
Intersensory Transfer Method	40.00	6.84	48.45	2.34
Context Method	35.90	13.10	40.55	13.46
Spelling Method	43.36	7.79	45.18	7.59
Phonics Approach	43.91	9.06	45.13	9.48
Control	38.17	11.77	38.58	12.11